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CENTRAL INTELLIGENCE AGENCY

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THE APPRAISAL OF CONTENT IS TENTATIVE.
(FOR KEY SEE REVERSE)

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50X1-HUM Comments:

1. For Aviation Ministry in Paragraph 1, read Ministry of the Aviation Industry.

2. For Chemical Industry in Paragraph 1, read Ministry of the Chemical Industry.

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COUNTRY : USSR

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THIS IS UNEVALUATED INFORMATION

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Research on Boron-Type Rocket Fuels

1. Near the end of 1949 the Chemical Group of OKB II received a verbal order from the Soviets to produce boron compounds for use in rocket engines. The order, , came originally from a chemical office in the Aviation Ministry, possibly even from an office of the Chemical Ministry. Primary interest was expressed in the B_4 series of compounds, and particularly those that existed in the liquid state. 50X1-HUM

2. The Chemical Group was to receive an official written order on the basis of which they would be able to procure apparatuses and chemicals. Although this was never received, preliminary projects were begun at the beginning of 1950 on the basis of the verbal instructions. Dr. DUNKEN was to direct this work and the specialists of the Chemical Group were assigned the following tasks:

   a. Dr. DANIEL worked on the production of magnesium boride, Mg_3B_2, and the production of boron bromide, BBr_3.

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b. Dr. HAHN worked on the development of analytical methods for detecting boron compounds. All his work was based on methods given in available literature.

c. Dr. JANKE worked on the reduction of boron bromide to borhydride by electrical charges in the presence of hydrogen.

[redacted] There was a little doubt in his mind because of the lapse of time, and he stated that it possibly could be B_4H_{10}, but he was more inclined to think that it was the former. He was not prompted or asked if the second formula could apply, but merely recalled that it might have been. At any rate the material under study belonged to the liquid homologues of the B_4 family. He referred to the fuel verbally as borhydride.

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d. Mr. STEFFES was to attempt the production of borhydride by catalytic reduction of boron bromide with hydrogen.

[redacted]

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3. The work of Dr. DANIEL began with the production of magnesium boride by reduction of sodium borate. Elementary boron was also produced by this method and converted with bromine to boron bromide. About 500 to 1000 grams of boron bromide were produced in the first quarter of 1950 and were used in other experiments.

4. Dr. HAHN was charged with working out and testing the analytical methods described in literature so that the subsequent analytical work and especially the detection of small amounts of boron could be done. The main method considered was a colorimetric one.

5. Dr. JANKE's work began with the development of an apparatus for his electrical process, but he had little success up until May 1950. At that time the Soviets canceled all further work by the Germans.

6. Dr. STEFFES was supposed to reduce boron bromide to borhydride by catalytic reduction with hydrogen. For this purpose a high vacuum apparatus was constructed, using materials available at the laboratory, and the experiments to develop a suitable catalyst were started. Carbon tetrachloride was used to test the effectiveness of the catalysts under study.

7. This project, which was still being worked on in May 1950, showed some success at the beginning. Partial separation of the chlorine from carbon tetrachloride at about 350°C in the presence of hydrogen occurred, [redacted] chromium-cobalt catalysts were under study at this time. They had been produced according to information available in their literature, especially a book by Frankenburger, entitled "Catalysts."

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9. The experiments were made so that boron bromide was transfused into a current of hydrogen over lithium hydride at about 200° C. [redacted] no success with this process, contrary to the information in [redacted] literature. Apparently under the reaction conditions [redacted] a transition product of lithium hydride, possibly with borhydride, was formed. In decomposing the reaction product with water or acetic acid, a "hypo-borate" could be detected. (The decomposition product might have been $K_2H_2B_2O_2$, [redacted]) Following decomposition with acids, the characteristic smell of borhydride was given off. The experiments were made on a small scale only, the amount of lithium hydride used being about one to two grams. Work was interrupted in May 1950.

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10. In parallel experiments, potassium and sodium hydride were produced from their amides by heating the amides in a current of hydrogen. Reactions between these hydrides and BBr_3 met with no more success than with lithium hydride.

11. [redacted] conduct this work on a larger scale and equipment for the production of larger quantities of lithium hydride and for its reaction with BBr_3 was developed. However work was halted by the Soviets and [redacted] no opportunity to continue. None of the equipment previously promised, such as the air liquefaction system, had arrived by the time the experiments were terminated.

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12. [redacted]

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[redacted] Comments:

It appears that Soviet interest in development of a fuel from the boron homologues came too late in the work program arranged for the German specialists for any concrete work to be done. Before their repatriation, however, the Germans furnished a foundation upon which the Soviets could continue. Source does not know whether or not work was continued by Soviets after May 1950, but thinks that it probably was, even though the Germans had very little success up to that time. It should be noted that the Germans were still measuring raw materials and results gram-wise, so that work was still in the embryonic state.